Paper No. 19

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte MICHAEL S. AMEEN,
JOSEPH T. HILLMAN, GERT LEUSINK, MICHAEL WARD
and
TUGRUL YASAR

Appeal No. 2001-1068
Application 09/063,196

ON BRIEF

Before HAIRSTON, RUGGIERO and DIXON, Administrative Patent Judges.

HAIRSTON, Administrative Patent Judge.

DECISION ON APPEAL

This is an appeal from the final rejection of claims 1 through 25 and 27 through 31.

The disclosed invention relates to a method of cleaning/stabilizing a plasma enhanced chemical vapor deposition (PECVD) processing chamber.

Claims 1 and 29 are illustrative of the claimed invention, and they read as follows:

1. A method of maintaining the stability of a PECVD processing chamber for the plasma enhanced chemical vapor deposition of titanium onto substrates when supported therein comprising the steps of:

following the plasma enhanced chemical vapor deposition of titanium in the reactor during which $TiCl_x$ is deposited onto and coats surfaces of components of the chamber:

> introducing an oxidizing or reducing gas into the chamber and exposing thereto $TiCl_x$ coated surfaces of components of the chamber for a period of time sufficient to allow the deposited material to stabilize the $TiCl_x$ coated surfaces.

29. A method of maintaining the stability of a CVD processing chamber for the plasma enhanced chemical vapor deposition of a metal-containing material onto substrates when supported therein comprising the steps of:

following plasma enhanced chemical vapor deposition of the material in the reactor:

> introducing a stabilizing gas into the chamber and exposing surfaces of components of the chamber that have been coated with unstable volatile compounds of the material to the gas for a period of time sufficient to allow the compounds of the material deposited

on the surfaces to stabilize to form a non-volatile film over which further unstable volatile compounds will be deposited when plasma enhanced chemical vapor deposition is repeated.

The references relied on by the examiner are:

Albrecht	5,109,562	May 5, 1992
Eichman et al. (Eichman)	5,271,963	Dec. 21, 1993
Shufflebotham et al.(Shufflebotham)	5,503,676	Apr. 2, 1996
Foster et al. (Foster)	5,716,870	Feb. 10, 1998
Mizuno et al. (Mizuno)	5,728,629	Mar. 17, 1998
Miyamoto	5,840,628	Nov. 24, 1998 (filed June 13, 1995)

Wolf, "Silicon Processing for the VLSI Era," Lattice Press, vol. 2, 1990, pp. 166, 167, 273 and 274.

Claims 1 through 3, 11 and 29 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Mizuno in view of Miyamoto.

Claims 4 through 6 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Mizuno in view of Miyamoto and Wolf.

Claims 7, 24, 25, 27 and 28 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Mizuno in view of Miyamoto, Wolf and Foster.

Claims 8, 9 and 12 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Mizuno in view of Miyamoto and Foster.

Claims 10, 13 and 14 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Mizuno in view of Miyamoto, Eichman and Foster.

Claims 15 through 17 and 20 through 23 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Eichman in view of Foster and Albrecht.

Claims 18, 19 and 31 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Eichman in view of Foster, Albrecht, Shufflebotham and Miyamoto.

Claim 30[1] stands rejected under 35 U.S.C. § 103(a) as being unpatentable over Mizuno in view of Wolf.

Reference is made to the briefs (paper numbers 14 and 17) and the answer (paper number 15) for the respective positions of the appellants and the examiner.

[1] Since claim 30 depends from claim 29, the rejection of claim 30 must of necessity include Miyamoto.

OPINION

Except for claim 29, we will reverse the obviousness rejections of all of the claims on appeal.

Turning first to the obviousness rejection of claim 29, appellants argue (brief, pages 6 and 7; reply brief, page 2) that Mizuno introduces a gas into a reactor chamber "to 'passivate' the tungsten film that builds up on the peripheral members" in the chamber, whereas claim 29 "makes the film on the chamber components 'stable' so that continued deposition of the volatile compounds continues unchanged, thereby providing a predictable and repeatable effect on the process," and that Miyamoto adds nothing to cure this deficiency in the teachings of Mizuno.

Appellants' arguments to the contrary notwithstanding, the disclosed invention (specification, pages 6 through 8, 10, 12, 19, 20 and 22) uses both "passivating" and "stabilizing" to describe how the gas introduced into the chamber effects the components in the chamber. For example, appellants state (specification, page 6, lines 4 through 7) that "chamber stabilization . . . or . . . passivation of internal reactor surfaces, eliminates an uncontrolled source of Ti-containing

species . . . ." A similar interchangeable use of the two terms can be found in the specification at: page 10, lines 4 through 11; page 12, lines 1 through 3; page 20, lines 5 through 7; and page 22, lines 9 through 11. For this reason, Mizuno's so-called passivation gas (Abstract; column 5, lines 6 through 44) performs the same function as the claimed gas, namely, stabilizing "the compounds of the material deposited on the surfaces" of the components/peripheral members in the chamber. Thus, the obviousness rejection of claim 29 is sustained.

Although we agree with the examiner that claim 29 would have been obvious based upon the teachings of the applied references, we reach the opposite result with respect to all of the other claims on appeal that rely upon Miyamoto as a secondary reference. Miyamoto does indeed use titanium tetrachloride in a plasma CVD process (Abstract; column 2, lines 28 through 50), but Miyamoto is completely silent as to passivation/stabilization of any titanium by-product(s) in the chamber. Based upon the lack of such a teaching in Miyamoto, we agree with the appellants' argument (reply brief, page 2) that "[m]erely demonstrating the existence of the missing chemical by citing ***Miyamoto*** does not

implicitly show motivation . . . .” Accordingly, the obviousness rejection of claims 1 through 14, 24, 25, 27 and 28 is reversed because the additionally cited references do not cure the noted shortcoming in the teachings and suggestions of Mizuno and Miyamoto.

The obviousness rejection of claim 30 is reversed because the applied references neither teach nor would have suggested to one of ordinary skill in the art “the simultaneous stabilization of the chamber and passivation of a substrate within the chamber” (brief, page 10).

Turning next to the obviousness rejection of claim 15, we agree with the examiner (answer, page 10) that Eichman discloses a plasma CVD process in which titanium tetrachloride is used in conjunction with ammonia (Abstract; column 1, lines 46 through 50; column 3, lines 47 through 66), that Foster teaches “the use of an inert gas mixture into the reactor . . . ,” and that Albrecht teaches “a cleaning process used to clean the reactor chamber of a CVD reactor . . . .” Notwithstanding our agreement with the examiner, we nevertheless agree with the appellants’ arguments (brief, page 12; reply brief, pages 2

and 3) that the applied references neither teach nor would have suggested to one of ordinary skill in the art the specifically claimed method steps of cleaning a chamber, depositing a film of coating material on the surfaces in the chamber, and thereafter introducing a gas into the chamber to stabilize the deposited coating material. Eichman is concerned with preventing the formation of a film of coating material in the reactor chamber (column 1, lines 5 through 7; column 2, lines 59 through 63), and not with the deliberate deposit of such a material. Thus, the obviousness rejection of claims 15 through 17 and 20 through 23 is reversed.

The obviousness rejection of claims 18, 19 and 31 is reversed because the teachings of Shufflebotham and Miyamoto fail to cure the noted shortcoming in the teachings of Eichman, Foster and Albrecht.

DECISION

The decision of the examiner rejecting claims 1 through 25 and 27 through 31 under 35 U.S.C. § 103(a) is reversed as to claims 1 through 25, 27, 28, 30 and 31, and is affirmed as to

claim 29. Accordingly, the decision of the examiner is affirmed-in-part.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 CFR § 1.136(a).

AFFIRMED-IN-PART

KENNETH W. HAIRSTON Administrative Patent Judge	)	
JOSEPH F. RUGGIERO Administrative Patent Judge	)	BOARD OF PATENT APPEALS AND INTERFERENCES
JOSEPH L. DIXON Administrative Patent Judge	)	

KWH:psb

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